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The Neumann KM64 microphone

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THE NEUMANN KM64 MICROPHONE

Technological Report No. L-062

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for Head of Research Department

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SUMMARY

This report describes tests carried out on the latest capacitor microphone, type KM64, manufactured by Messrs. Neumann of Berlin. The microphone has a cardioid directional characteristic and is of the end-fire type of design.

Measurements have been made of the frequency characteristics for sound incident at various angles; the degree of interference from wind, with and without a windshield, and from magnetic fields has also been determined. The microphone frequency characteristics are uniform and the degree of magnetic interference is low; the level of wind noise is somewhat above average for the unshielded microphone but is acceptable when a windshield is employed.

1. INTRODUCTION

The Neumann company of Berlin has introduced a new capacitor microphone which nominally has a cardioid directional characteristic. Two similar versions are made, one, type KM64, with a valve type AC701K and the other, designated U64, with a Nuvistor type 7586 in the head amplifier. The performance specification is the same for each version and this report relates only to the KM64 model. To prevent very high sound levels from overloading the head amplifier, a 10 dB attenuator is incorporated ahead of the valve and is inserted by means of a switch. A 2-inch (51 mm) diameter plastic windshield, type number Z118, is available.

2. DESCRIPTION

Fig. 1 gives an external view and dimensions of the microphone which will be seen to be very similar in appearance and size to its predecessor the KM54a, of which it is claimed to be an improved version. The windshield, designed to enclose the entire capsule, relies on friction to grip the microphone case and no definite means of location is provided.

The weight of the microphone is 4¼ oz (120 g) without leads.

The cost of the microphone to the BBC is £68. 2s. 6d.; the mains unit costs an additional £57. 18s. 6d., making a total of £126. 1s. 0d.

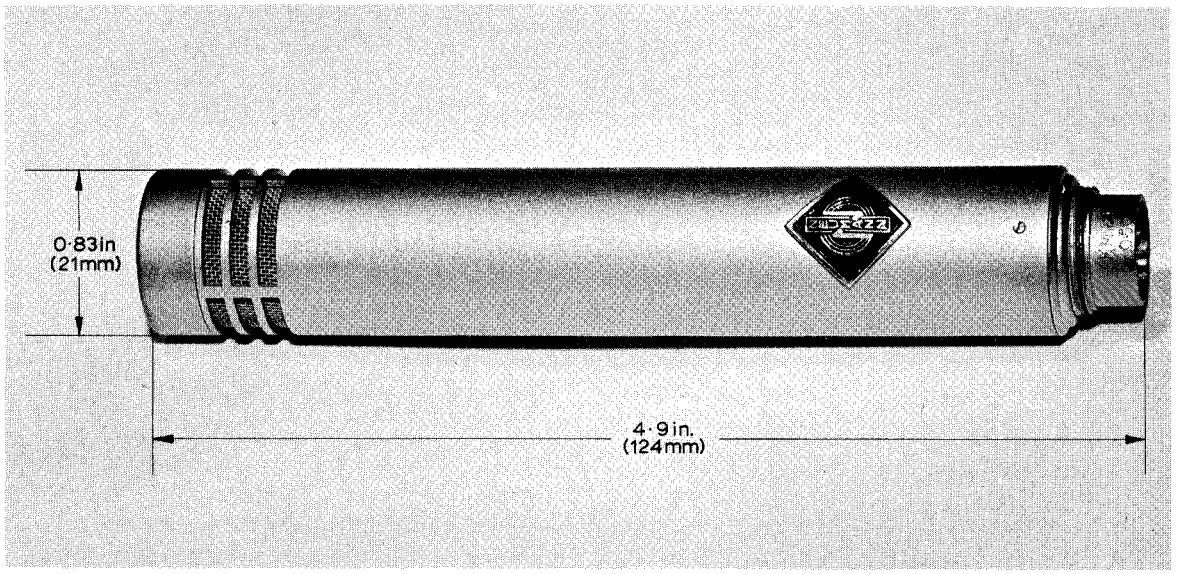

Fig. 1 - External appearance and dimensions of Neumann microphone type KM64

3. PERFORMANCE

3.1. Method of Measurement

The frequency characteristics above 200 c/s were measured by comparison with a pressure standard in a free-field room. Below this frequency the characteristics were measured in a travelling-wave duct by comparison with the same standard. Generally the accuracy of comparison is ± ½ dB but errors of ± 1 dB can occur for sound incident at angles greater than 90°.

3.2. Frequency Characteristics

Fig. 2 shows the open-circuit frequency characteristics for sound incident at various angles. It will be seen that the characteristics extend to high frequencies, and that not only is a very high front-to-back ratio maintained over the whole frequency range, but also the shape of the frequency characteristic at 90° and 135° varies very little from that on the axis.

3.3. Impedance

The modulus of the impedance is 180 ohms and is substantially independent of frequency. The on-load frequency characteristics do not, therefore, differ appreciably from the open-circuit curves given below.

3.4. Sensitivity

The mid-band sensitivity of the microphone is -58 dB with reference to 1 volt/dyne/cm^2; this figure is about the normal value for capacitor microphones.

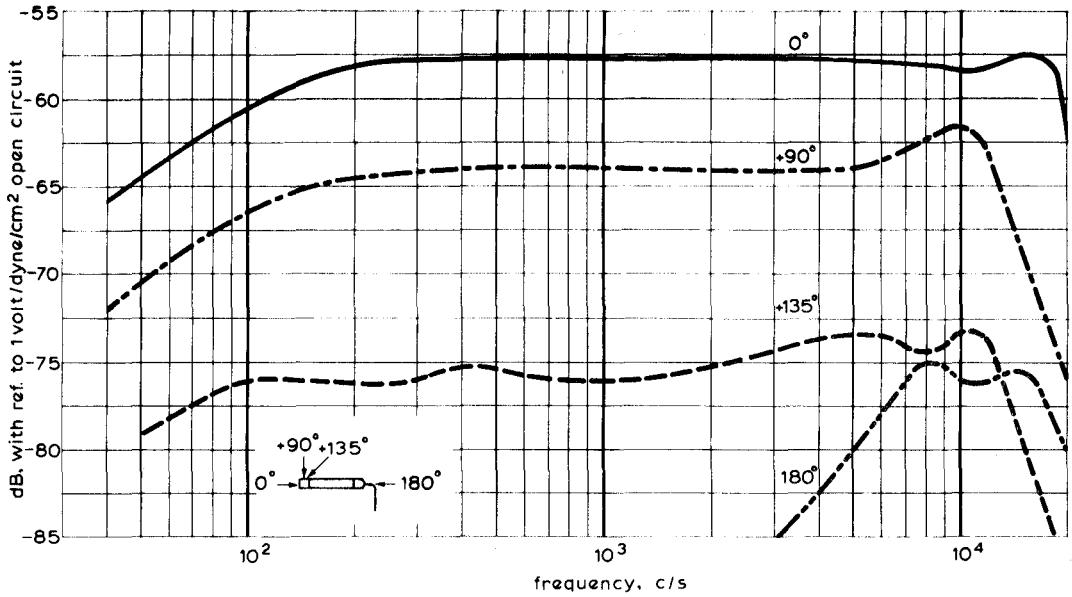

Fig. 2 - Frequency characteristics of Neumann microphone type KM64 No. 050

4. NOISE

4.1. Internally Generated Noise

The internally generated noise appearing at the output terminals of the microphone is the sum of flicker effect in the valve and of thermal agitation in the resistive component of the grid circuit impedance. The open-circuit noise when weighted by an aural sensitivity network type ASN/3 is -109 dB with reference to 1 volt. The mid-band sound pressure required to give the same output level is +23 dB with respect to 2×10^{-4} dyne/cm^2. This level is lower than that from many microphones but is not so low as that obtained from some recent capacitor microphones which employ radio-frequency biassing.[1]

4.2. Interference from Magnetic Fields

Measurements were made of the maximum open-circuit voltage induced in the microphone by a magnetic field. The unweighted mid-band sound levels, with reference to 2×10^{-4} dyne/cm^2, required to give an output equivalent to that produced by a uniform field of 1 milligauss at 50 c/s, 1 kc/s and 10 kc/s are -4 dB, +13 dB and +27 dB respectively. These levels are regarded as extremely low and should cause no trouble under normal studio conditions.

4.3. Wind Noise

Open-circuit measurements were made of the wind noise produced when the microphone was placed at various angles to a streamlined air flow of 10 m.p.h., both for the normal condition and with equalisation so that the axial response was uniform within ± 1 dB from 1 kc/s down to 40 c/s; below 40 c/s the output was attenuated by

a high-pass filter. Additional measurements were made with the manufacturer's windshield on the microphone and also with a smaller one designed by Research Department in 1956 for the type KM54a. The noise was weighted by the standard A.S.A.* networks and measured by a V.U. meter; the results are given in the following table in terms of the sound level at 1 kc/s which would give the same r.m.s. output from the microphone.

MICROPHONE CONDITION		ANGLE				
		0°	45°	90°	135°	180°
		SOUND LEVEL, dB WITH REFERENCE TO 2×10^{-4} dyne/cm^2				
Unshielded KM64	Unequalised	+106	+99	+100	+103	+92
	Equalised	+113	+108	+108	+112	+99
With KM54a Windshield	Unequalised	+81	+82	+71	+91	+79
With maker's windshield, type Z118	Unequalised	+70	+72	+71	+82	+73

The wind noise levels from the microphone in the unshielded condition are rather higher than from many studio microphones. However, preliminary reports from O and M Department suggest that either of the windshields reduces the noise to an acceptable level under studio conditions.

4.4. Interpretation of Noise Measurements

In applying the results of the noise measurements it should be remembered that the aural sensitivity weighting, where used, is intended to give an indication only of the loudness of the noise. The subjective assessment of the annoyance produced depends also on other factors such as the degree to which the interference may blend with studio atmosphere and other background noise.

5. CONCLUSIONS

The type KM64 microphone appears to be a good replacement for the type KM54a. The frequency characteristics are more uniform than those of its predecessor and the weighted internal noise level is lower. The interference from magnetic fields is very low but the wind noise is somewhat above average; the use of a windshield reduces this to an acceptable level under studio conditions.

6. REFERENCE

1. BBC Research Department Report in preparation, 'The AKG type 628 and Sennheiser type 404 Microphones'.

* American Standards Association, Standard Z 24·3 (1944), 'Sound Level Meters for Measurement of Noise and Other Sounds'

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